

**“Take the picture or not take the picture?”: Children’s Awareness of When Private
Information Should be Protected**

Approved thesis

by

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Abstract

Children develop an understanding of privacy through real and virtual experiences. As digital sharing becomes increasingly common, so does the risk of privacy violations, highlighting the growing need for researchers to study children's reasoning about when and how to protect their personal information. The present study examined how children reason about the sharing of personal images and how this reasoning changes with age. Two within-subjects experiments were conducted with children aged 5–8 years old. In Experiment 1 (N=82), children were told that a girl named Sally should “keep things private” while playing an online game and then decided whether the game should take pictures of either real Sally or a cartoon avatar in different household settings. Younger children (5–6 years old) were generally uncertain about whether images should be shared, whereas older children (7–8 years old) were more likely to endorse withholding images of real Sally but remained uncertain about cartoon images. An exploratory analysis further indicated that younger children who understood the privacy prompt were more likely to endorse withholding images than those who did not. Experiment 2 removed the cartoon avatar to test whether children's responses were driven by the image content. Results (N = 87) replicated the pattern of withholding images of real Sally while showing greater acceptance of sharing cartoon rooms, suggesting that with age children increasingly consider the personal nature of information when reasoning about privacy protection.

Keywords: *digital privacy, children's privacy, privacy norms, privacy protection*

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Dedication

I would like to dedicate this thesis to my parents, Blair and Cindy Petriw, for their love, support, and encouragement throughout this journey. I would also like to dedicate this work to my dog, Oscar, whose grouchy attitude, dramatic sighs, and strict snack and medication schedule kept me grounded during the writing process.

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“Take the picture or not take the picture?”: Children’s Awareness of When Private Information Should be Protected

As children spend more time in digital environments, understanding how they develop privacy norms has become increasingly important for their safety. Online exploitation involving children continues to be reported. For instance, a recent news report described how a seven-year-old girl in Manitoba was coerced into sending nude photographs to a man through Snapchat (Annable & Allan, 2026). Unfortunately, cases like this are not rare, and reports of child sextortion have increased substantially in the past five years (Cybertip, 2023). Protecting children from digital risks, including photo exploitation and surveillance, requires children to understand when their privacy needs to be protected. This study explores children’s thinking about when private information should be protected. It directly assesses these normative expectations by asking children when personal photos *should be (or should not be)* shared with an app.

The normative judgment of what “should be shared” or protected is a complex one. But we know that by adulthood, adults have normative beliefs about the type of information that should be shared and when (Nissenbaum, 2011). This includes privacy norms that dictate when and how personal images should be shared and protected (Bietz et al., 2019; Hoyle et al., 2020). For example, images depicting private spaces, such as one’s home, are typically shared less frequently by adults and are regarded as more private (Hoyle et al., 2020). These behaviours reflect societal expectations of the appropriate boundaries between public and private in both digital and non-digital contexts (Hoyle et al., 2020). However, it remains unclear whether children share common basic adult normative beliefs about privacy, including the basic belief that information like personal images, such as those depicting private spaces, should not be

shared to protect one's privacy. Understanding how these beliefs develop is important, as the aforementioned work with adults highlights how privacy governs not only the detection of moral violations afterwards, but also important privacy-related considerations about what information is shared in online contexts.

From a practical perspective, understanding when and how children come to appreciate when their privacy needs to be protected has important clinical implications for promoting psychological well-being and safeguarding children from privacy-related distress. For example, a better understanding of children's knowledge can allow us to develop developmentally appropriate interventions that align with children's levels of understanding. Only by meeting children where they are can we enhance children's privacy awareness in meaningful ways, and ultimately support their well-being and digital safety.

From a theoretical perspective, the present question is important as it has a bearing on the starting point of privacy concepts. For example, if children understand from a young age that private, but not other kinds of information, need to be protected, then it would be informative for the degree to which cultural expectations, social input (i.e., parents, teachers), and first-hand experiences are necessary to develop mature privacy norms that include when and how to protect one's information. We know that children are precocious norm learners (for a review of early normative development see Paulus & Schmit, 2018). Identifying how and when privacy develops can contribute to the growing literature invested in understanding the early development of normative understandings.

The literature I review next hints that this ability may develop during middle childhood (for a review see Gelman et al., 2025); however, prior work has never investigated the present

question directly. The topic of privacy has been examined across two disparate literatures. The first is on physical privacy, which has focused primarily on observational work on how children behave in private spaces. The second is digital and has examined issues related to safety and children's ability to detect and reason about privacy violations. These studies have relatively small sample sizes and mainly rely on qualitative measures (see exception; Gelmen et al., 2018; 2021). No work to our knowledge has examined children's beliefs about when personal information should (or not) be shared, a common privacy judgment.

Children's Understanding of "Private"

To understand that private, but not other kinds of, information should be protected, children must be able to distinguish between public and private information. Research suggests that young children have some understanding of what is private during childhood. Qualitative studies asking children to depict privacy in drawings suggest that by 5-years-old, children primarily associate privacy with physical spaces, such as bedrooms and bathrooms, where they can be alone (Oates et al., 2018). Similarly, qualitative research using semi-structured interviews asking children about digital threats to their privacy shows that 5- to 6-year-olds conceptualize privacy in concrete terms, often linking it to physical barriers (e.g., closing doors, hiding) rather than more abstract notions like data security (Blinder et al., 2024; Sun et al., 2021; Williams et al., 2023). Observational studies indirectly support that young children understand the difference between private and public space. In these studies, children behave differently in private or "secret spaces," such as forts, playhouses, or hidden corners within their homes (Moore et al., 2021). Further, they also often display distinct behavioural changes, such as lowering their voices, focusing on solitary activities, or avoiding interaction with others (Corson et al., 2014; Moore et al., 2021). As children age, they appear to view more diverse kinds of content as

private (Agesilaou & Kyza, 2022; Kumar et al., 2017; Zhao et al., 2019). By ages 7- to 8-years-old, children depict a greater variety of content in their privacy drawings (Oates et al., 2018). For example, children in this age range include non-tangible property like ideas and digital content like passwords in their drawings of privacy (Oates et al., 2018).

There has also been work looking at related but distinct concepts like ownership (For a review, see Pesowski et al., 2022). Research shows that even young children, ages 4- to 6-years-old, have a relatively sophisticated understanding of ownership (Cleroux et al., 2022; Neary & Friedman, 2013). By this age, children recognize that owners have more rights to use their property than non-owners (Noles & Gelman, 2014), including deciding when and how these objects are used. Ownership is similar to privacy in that they both dictate how things are accessed. But ownership does not necessarily mean that an item is private. For instance, many people own tools like forks, which are rarely considered private. There is also literature showing that children appreciate other seemingly similar personal dimensions of property like personal value (Hall et al., 2023). This literature shows that children appreciate that individuals may place significant personal value on certain possessions with special histories, such as objects that are/were owned by famous people (Heartly et al., 2020; 2025). For example, 6- to 7-year-olds will choose objects with distinct and special histories (i.e., the individual won this medal at a race), as compared to objects with a mundane history (i.e., the individual got this medal at a store; Pesowski & Friedman, 2019). Although many private items are important to their owners, personal value is also distinct from privacy. For example, people often choose to display personally valued objects publicly. Altogether, these literatures suggest children reason in sophisticated ways about related concepts, but due to their differences, we cannot automatically assume children's awareness of ownership and value equates to an awareness of privacy.

Children's Normative Expectations of Privacy

Further, to understand that one's private information should be protected, children must be aware that privacy norms govern appropriate behaviour. Prior work suggests that young children may have some expectations about how privacy should function in different social and digital contexts, including an awareness of the consequences of violating privacy norms. Observational and quantitative studies indicate that 5- to 6-year-old children are aware of online safety rules, but their knowledge of these norms may be more akin to social scripts (Ey & Cupit, 2011; Kumar et al., 2017; Williams et al., 202). During interviews, they will discuss highly specific norms related to not sharing passwords and avoiding interactions with strangers (Kumar et al., 2017). Adherence to norms appears to be mainly motivated by external factors, such as fear of parental punishment (Ey & Cupit, 2011; Kumar et al., 2017; Zhang-Kennedy et al., 2016), rather than a deep understanding of privacy risks or greatly valuing privacy. Children at this age will also discuss norms around the need to restrict physical access to private spaces (Zhang-Kennedy et al., 2016). For example, a qualitative study using semi-structured interviews asking children about perceived privacy threats suggest that older children, aged 7- to 8-years-old, will protect their personal spaces from unwanted intrusion, such as stopping siblings or peers from looking through their belongings, or tampering their their technology, suggesting that children of this age will sometimes enforce privacy norms (Zhang-Kennedy et al., 2016). Related to this issue, in interviews about technology, children in middle childhood report that thinking about violations of privacy norms makes them feel "creepiness" (Yip et al., 2019). Further, when interviewed about digital privacy risks, children aged 4- to 6-years-old also frequently describe privacy as a behaviour that involves avoiding strangers or hiding personal belongings to prevent unwanted access (Sun et al., 2021).

Two systematic experimental studies have been conducted that can offer some further insights. Gelman et al. (2018) examined how children aged 4- to 10-years-old evaluate digital privacy with mobile GPS tracking. This study has implications for both ownership reasoning and privacy. In terms of ownership, children as young as 5-years-old considered ownership in their judgments, as they viewed it more okay for an owner to track their own belongings than someone else's belongings. However, children of all ages viewed GPS tracking more positively than adults, indicating a lack of awareness of how digital tracking invades someone's privacy. The finding that children generally view tracking positively was largely replicated in a second study, Gelman et al. (2021). Here, children also considered trust wherein they viewed it more acceptable to share personal information with an individual who was nice compared to mean, and ingroup versus outgroup members. Relevant to the current investigation, in this same paper, Gelman and colleagues also examined the acceptability for a tracker to access "public" versus "private" photos on a computer. Children were less positive about the acceptability of tracking private photos, but generally viewed tracking of photos positively, with their judgments only appearing below midpoint rates by 9-year-olds. This paper suggests that children under 8-years-old view accessing public photos as less of a privacy invasion than accessing private photos, but also their generally positive judgments suggest they may not view accessing private photos as a true privacy concern. Of note, the "private" photos used in this study were not always very "personal" and some items may have been hard for young children to understand their private nature and therefore the nature of the violation. For example, one such item was a home safe. Altogether, it is not clear from these papers how young children reason about privacy protection per se. Instead, these papers suggest that children view the aforementioned invasions

as merely an infringement upon someone's ownership rights. If they viewed them as a privacy violation, then they should have given them negative ratings as adults did.

Altogether, the diverse literature we review shows that children between 5-years-old and 8-years-old are aware that privacy exists, and that it likely has normative elements. It is difficult to map age related changes in privacy thinking is difficult as past research uses diverse content to study privacy, from prompting children with various privacy scenarios to consider through semi-structured interviews (Agesilaou & Kyza, 2022; Blinder et al., 2024, Kumar et al., 2017; Zhao et al., 2019), analyzing drawings of what children deem private (Oates et al., 2018), to observational studies examining children's behaviour in private spaces (Corson et al., 2014; Moore et al., 2021), to fully experimental studies (Gelman et al., 2018; 2021); in this way, comparison across these studies is very difficult. However, this literature suggests that between the ages of 5- and 8-years is likely a critical window to study privacy norms, including children's beliefs about when and how personal information should be protected.

The Present Studies

The present studies address two specific research questions about children's awareness of when private information should be protected: i) How do children consider the privacy of content when reasoning about when to share or protect information?, and ii) How does their thinking change with age? In the published version of this thesis, a third experiment will be included. Notably, unlike prior work, the present studies focus on how privacy governs the protection of personal information because it is a critical privacy decision that has been studied in adulthood (e.g., Hoyle et al., 2020). It is also likely a decision that is less confounded with related

constructs like ownership, as ownership per se does not clearly dictate what should not be shared.

To examine these research questions, I conducted two within-subjects experiments. Experiment 1 examined whether (and when) children can use privacy norms to make normative judgements about protecting personal information. Children aged 5- to 8-years-old were told a story about a girl named Sally, who was asked to share a personal photo within an online game. Photos depict Sally in three different personal settings: a bedroom, a family room, and a kitchen (see prior work with privacy and space; Oates et al., 2018; Sevinçli & Şahin, 2024). Children were then presented with a prompt designed to encourage their thinking about privacy norms. This prompt informed children that Sally needed to “keep things private,” without specifying what the privacy referred to. The purpose of this prompt was to activate children’s thinking about privacy norms, as previous work suggests that making norms salient can increase children’s adherence to them (House & Tomasello, 2018). As such, it is possible that prior research may underestimate children’s abilities to make privacy-related decisions when those norms are not made explicit. Children were then asked whether Sally should allow the game to take a picture or not, with “not sharing” judgments indicating protection of the information. In a comparison condition, children were shown pictures of a cartoon avatar in a similar setting, which should not be construed as private or in need of protection. If children can consider the privacy of content when evaluating when to share a picture, they should endorse taking pictures of real Sally less often than cartoon Sally.

Experiment 2 was a follow-up to Experiment 1. It sought to explain the findings of Experiment 1. Experiment 1 found that children endorsed taking a picture of both cartoon and real Sally across conditions. This experiment allowed us to test between two explanations of

children's behaviour. One possibility is that children's behaviour in Experiment 1 is best explained by a "content-based explanation" or by an increase in their sensitivity to the content of the photos. Namely, children might judge that cartoon Sally's photos and real Sally's photos should be protected because the prompt might have led them to notice similarities between cartoon and real Sally and then view cartoon Sally as personal. Conversely, a normative explanation suggests that children's behaviour reflects thinking about privacy norms, just not in adult-like ways. Namely, they may view privacy as a norm that involves the protection of all information in one's possession, even non-personal "cartoon" information. To test between these possibilities, I modified the task by removing images of the cartoon Sally and instead presenting only the settings (e.g., bedroom, kitchen, living room). It is predicted that if children are relying more on the content of the picture to apply their privacy norms, I will see higher acceptance of "take a picture" in the modified cartoon condition, as compared to the real Sally condition. However, if children use a normative-based approach, I will see, again, similarly low rates of 'take picture' across the board.

Experiment 1

Participants

The target sample was 80 children. The final sample for Experiment 1 included 82 children aged 5- to 8-years-old (20 five-year-olds, 20 six-year-olds, 21 seven-year-olds, and 21 eight-year-olds). The sample identifies as: 64.2% girls, and 35.8% boys. The racial/ethnic identities of the children in the sample were divided as follows: 37.2% White, 22% Asian, 17.3% First Nations/ Inuit/ Metis, 9.9% were unknown, and 13.6% other. The sample size was based on the sensitivity analysis from prior experiment. However, to be certain of the required sample, I also conducted a power analysis using linear models as approximations and the pwr package in R

Studio (Champely et al., 2018). This analysis suggested that at least 77 participants were appropriate for detecting a moderate effect size ($f^2=.15$). Seven children were excluded for the following reasons: (2) technology malfunction, and (5) parental/sibling interference.

Children were recruited from the Manitoba Museum. After participation, children were remunerated with a small toy worth no more than \$2. A consent form was provided to the parents to sign, and no directly identifying information was collected. To consent, parents would click a button to consent their child to participate in the study. Parents were also offered an information sheet on online safety once the study was over.

This experiment included a comprehension question related to the privacy prompt. As described further below, children were only included in the main analyses if they passed this comprehension question. To this end, an additional 17 children were excluded from the main analysis because they did not pass the comprehension question: eleven 5-year-olds, and six 6-year-olds. As described further below, due to the significant number, I did include an exploratory analysis looking at this data.

Procedures and Materials

The study was administered in person using the survey software Qualtrics on a tablet. At the start of the study, children were introduced to a girl named Sally and were told that Sally likes to play games on her computer, and the participants were shown what Sally's avatar in the game looks like. Figure 1 shows experiment stimuli and text.

Children were then introduced to a privacy prompt. The goal of introducing the prompt was to activate children's thinking about privacy norms without explicitly telling them how the norm should apply (see research on norm highlighting, House & Tomasello, 2018). Children

were told, *“Sally’s parents tell her to keep things as private as possible when she’s playing computer games. They think it is very important that she protects her privacy when she is playing games on her computer.”* Children were then asked the comprehension question, *“What did Sally’s parents tell her to do when playing her computer games?”* To pass the comprehension question, children had to respond that Sally’s parents told her to keep her things private or provide a similar response. If children were unable to answer, they were allowed to return to a reminder of the prompt up to three times. If they were still unable to provide a correct response after the third exposure, they continued participating in the study but were excluded from the main analyses. Before the second block of trials, children were reminded of the privacy prompt (*“Remember, Sally’s parents told her to keep things as private as possible when she’s playing computer games”*).

Children were then told that to make the game more fun, the game wanted to take and keep some pictures of either Sally’s cartoon rooms or real Sally, and they needed to help Sally decide whether she should let the game take the picture or not take the picture. Real Sally’s photos were AI-generated (Canva AI Text to Image, February 2023).

After this introduction, children were presented with two blocks (counterbalanced between participants): real Sally and cartoon rooms. Real and Cartoon Sally appeared in three different settings (kitchen, living room, and bedroom), and the order of the settings was randomized within each block. These settings were selected based on prior work indicating that children often draw spaces such as bedrooms when asked to represent private spaces (Oates et al., 2018). For each setting or trial, children were told that the game wanted to take a picture of either cartoon or real Sally in that setting and were asked whether Sally should let the game take the picture or not.

At the test, children could respond verbally, point to their chosen response, or touch the answer on the screen. The screen displayed a checkmark to indicate “take a picture” and an “X” to indicate “don’t take a picture.” The experimenter pointed to and verbally labelled each option to ensure that children understood the response choices. If a child’s answer was unclear or if they responded “I don’t know,” they were prompted once with the reminder that “there’s no right answer, just try your best”.

Results and Discussion

Analytic Plan

For both experiments, to analyze the effects of age and context on children’s privacy-related decisions, I ran a binary logistic mixed-effects regression model in RStudio using the lme4 package and glmer function (Bates et al., 2015). This model is appropriate given the binary outcome variable (i.e., whether children choose to share the photo) and the within-subjects structure of the data, with multiple observations per child. The following specific variables were included in the analysis: the dependent variable was photo sharing (binary: 1 = take picture, 0 = don't take picture), and the predictor variables were children’s age in months centred, Condition (cartoon room vs. real Sally) and the random intercept of (1|id). Effect sizes are reported as odds ratios. To understand any age effects, children will be divided by age group, and follow-up analyses were conducted on these age groups using further binary mixed regressions to examine the effects of condition.

One-sample t-tests against chance are also used to further understand the valence of children’s privacy decisions. For these one-sample t-tests, children were given a score in each condition that represents the number of times out of three potential times they selected ‘take picture’.

Main Analyses

The results of the main binary logistic mixed-effects regression indicated that there was a main effect of age, $b = -0.05$, $SE = 0.02$, $z = -2.27$, $p = .022$, $OR = 0.95$, but no main effect of condition, $b = 0.18$, $SE = 0.13$, $z = 1.41$, $p = .16$, $OR = 1.20$. These main effects were qualified by an age by condition interaction, $b = 0.04$, $SE = 0.009$, $z = 3.86$, $p < .001$, $OR = 1.04$. Figure 2 illustrates the relationship between age and scores for each condition. Follow-up analyses revealed that younger children's judgments, ages 5 - 6 years, did not differ by condition, $b = -0.20$, $SE = 0.17$, $z = -1.15$, $p = .25$, $OR = 0.82$. However, in older children, ages 7-8 years, the condition did predict endorsements of taking a picture, $b = 0.66$, $SE = 0.18$, $z = 3.71$, $p < .001$, $OR = 1.94$.

To further examine these patterns, tests against chance (1.5) were conducted. Results indicated that younger children were unsure about whether or not the game should take a picture of both cartoon, $M_{take_picture} = 1.25$ (1.37); $t(39) = -1.15$, $p = .26$, and real Sally, $M_{take_picture} = 1.40$ (1.34); $t(39) = -0.47$, $p = .64$, with judgments not differing from chance rates. Older children, however, deemed that images of real Sally should be withheld $M_{take_picture} = 0.64$ (1.06); $t(41) = -5.26$, $p < .001$, and images of cartoon Sally remained at chance, $M_{take_picture} = 1.21$ (1.39); $t(41) = -1.33$, $p = .19$.

In sum, younger children were unsure of whether or not the game should withhold images of both cartoon and real Sally. In contrast, older children fully endorsed withholding images of real Sally but were at chance for cartoon Sally images. They did show some selectivity in their judgments, endorsing that real Sally's images should be withheld the most.

Exploratory Analyses

An exploratory analysis was conducted to examine whether children who did not pass the comprehension question responded differently from those who did. I planned to exclude children who did not pass the comprehension question, as I predicted that this likely meant they did not understand the goal of “keeping things private” and so could not benefit from the prompt. I wanted to give (especially younger children) the best chance possible to demonstrate their understanding, which would not be possible if they did not understand the prompt at all. This being said, I was surprised by the number of children who failed the comprehension question, and thus next examined whether the behaviour of excluded children differed from that of included children. A binary logistic mixed regression was run. Because only 5- and 6-year-old children were excluded, only 5- and 6-year-old children were included in this analysis from the included sample. This regression included predictors of inclusion status (1,0), condition (real, cartoon), interactions, and a random intercept of participant ID. I found a main effect of inclusion status where included children were less likely to endorse sharing images than excluded children, $b = .76$, $SE = 0.38$, $z = 2.0$, $p = .046$, $OR = 2.15$. There was no main effect of condition, $ps = .079$, or interaction, $ps = .58$. Together, these findings suggest that included children were more likely to endorse withholding images, likely because they were benefitting from the prompt in some way.

Experiment 2

Experiment 1 found that with the prompt, children were more likely to endorse withholding images of both cartoon and real Sally. Despite showing condition differences, older children’s judgments in the cartoon condition were uncertain. I did not predict such high endorsement of withholding cartoon images. Thus, this experiment sought to replicate the

findings in the real Sally condition and to understand why children endorsed withholding the cartoon images at higher rates.

When completing Experiment 1, some children spontaneously disclosed after the experiment that the similarity between the cartoon and real Sally was the reason they chose to protect cartoon Sally's image. This disclosure guided the design of Experiment 2. One possibility for children's judgments in Experiment 1 is a content-based explanation. The prompt may have increased children's sensitivity to the image content, leading them to notice similarities between cartoon and real Sally and view cartoon Sally as personal. Alternatively, a normative explanation suggests that children may view privacy protection as applying to all information in one's possession, even non-personal cartoon information. To test between these possibilities, I removed images of the cartoon Sally and presented only the setting (e.g., bedroom, kitchen, living room). It was predicted that if content was influencing children's judgements, I should see lower endorsement of withholding cartoon images in this experiment. As a reminder, I also sought to replicate the key findings of Experiment 1, where taking pictures of real Sally was endorsed at very low rates.

Participants

The target sample size was 84 children or 28 per age in years (6- to 8-year-olds). I recruited 87 children. Three additional children were tested on the last day of testing. Four children were excluded for reasons related to language barriers or parental interference, and four additional children were excluded due to not passing the comprehension question. The sample identifies as: 56% girls, and 44% boys. The racial/ethnic identities of the children in the sample were divided as follows: 52.9% White, 6.9% Asian, 11.5% First Nations/ Inuit/ Metis, 11.5% were unknown, and 17.2% other. The sample size was determined to be needed using the same

methods as Experiment 2. Five-year-olds were excluded because they struggled the most to pass the comprehension question. I retained the 6-year-olds with hopes of being able to detect developmental change.

Procedures and Materials

The procedure for Experiment 2 will be identical to Experiment 1. Similar to prior Experiments, children will be shown real Sally in three settings: kitchen, living room, and bedroom; however, children will only see the three cartoon settings, omitting cartoon Sally from them.

Results and Discussion

Analyses

As a reminder, Experiment 2 tested two possible explanations for children's behaviour in Experiment 1. Both age $b = -0.08$, $SE = 0.03$, $z = -2.42$, $p = .016$, $OR = 0.93$, and condition $b = 0.85$, $SE = 0.15$, $z = 5.56$, $p < .001$, $OR = 2.35$ predicted children's judgments. These main effects were qualified by an interaction between age and condition, $b = 0.05$, $SE = 0.01$, $z = 3.30$, $p < .001$, $OR = 1.05$. Figure 3 illustrates the relationship between age and scores for each condition. When separating the results by age group, simple effects regression indicated that 6-year-olds' responses did not vary by condition ($b = 0.36$, $SE = 0.19$, $z = 1.93$, $p = 0.053$, $OR = 1.44$). But, both 7-year-olds ($b = 0.80$, $SE = 0.25$, $z = 3.24$, $p = .001$, $OR = 2.23$), and 8-year-olds ($b = 1.53$, $SE = 0.38$, $z = 4.04$, $p < .001$, $OR = 4.60$) endorsed taking pictures of the cartoon rooms more than real Sally.

To examine these patterns further, t-tests against chance (1.5) were conducted across the age groups. Results indicated that 6-year-olds judged to withhold images of real Sally ($M_{take_picture} = 1.06$ (1.18); $t(30) = -2.05$, $p = .049$), but were unsure of whether images of the cartoon rooms

should be withheld ($M_{take_picture} = 1.39 (1.23)$; $t(30) = -0.51$, $p = .61$). However, 7-year-olds judged to withhold images of real Sally ($M_{take_picture} = .54 (0.88)$; $t(27) = -5.79$, $p < .001$), but were uncertain about cartoon rooms ($M_{take_picture} = 1.11 (1.29)$; $t(27) = -1.62$, $p = .12$). In 8-year-olds, a similar pattern was once again found, where children decided to withhold images of real Sally ($M_{take_picture} = 0.29 (0.71)$; $t(27) = -9.02$, $p < .001$), but were uncertain about cartoon rooms ($M_{take_picture} = 1.00 (1.31)$; $t(27) = -2.03$, $p = .053$). Overall, findings replicated from Experiment 1. Older children (7-years and 8-years) judged to withhold images of real Sally, but were less certain about withholding images of cartoon rooms. Findings with 6-year-olds and chance differences among conditions should be taken with caution, as their judgments did not differ by condition in the regression analysis.

General Discussion

The present research explored children's understanding of withholding images as a proactive strategy for protecting privacy. Across experiments, children's reasoning shifted with age: older children were more likely than younger children to judge that real Sally's image should be withheld compared to a cartoon image, suggesting a growing recognition that withholding personal images is important for protecting privacy. However, children's reasoning also showed meaningful nuance across experiments.

Older children, around 7-years-old, across experiments were less likely to endorse taking an image of real Sally than cartoon Sally. After being explicitly prompted to consider privacy protection in Experiments 1 and 2, they showed caution about sharing Sally's image. As a reminder, I never instructed children *how* Sally ought to protect her privacy. Prior work on digital privacy reasoning has sometimes found that children aged 8-years-old do not perform in the same way as adults (Gelman et al., 2018; 2021). For example, in one study, 8-year-olds viewed

invasions of someone else's privacy as neutral, whereas adults viewed it as unacceptable (Gelman et al., 2018, 2021; also see Tan et al, 2025). Therefore, a novel contribution of the present work is that, when prompted to consider privacy, the neutrality seen in previous research was not present. Older children were certain that personal images of real Sally should be withheld, and to a greater extent than cartoon images.

This finding might help to reconcile findings in prior work about other components of privacy. Namely, qualitative studies often find that children as young as 5- or 6-year-olds can reflect on the importance of digital privacy (e.g., Sun et al., 2021), yet experimental studies often seem to find children as old as 8-year-olds struggling to reason about privacy violations in an adult-like way (e.g., Gelman et al., 2021). This difference may be due to the differences in salience of privacy across diverse study types. Namely, because qualitative studies directly ask about privacy, it makes sense that young children show more success if differences are due to the spontaneous consideration of privacy norms and knowledge. This finding fits with broader developmental themes, showing that children's performance on normative reasoning tasks increases when the salience of the norm increases through mechanisms, like explicit highlighting (House & Tomasello, 2018), the presence of an authority figure (Zhao & Kushnir, 2018), or self/other manipulations (Riggs & Young, 2016).

I also found across experiments that with age, children were increasingly more likely to endorse withholding personal images. Indeed, in all experiments, younger children's judgments did not differ between real Sally and cartoon Sally. But, it is worth noting that young children, under 7-years-old, who passed the comprehension question were more cautious with their judgments of sharing images being closer to chance. Younger children's increased willingness to share images, and thus lower levels of concern for privacy, especially among those who failed

the comprehension question, are consistent with prior work suggesting that digital privacy reasoning is likely to develop during middle childhood. For example, prior work has found that young children evaluate privacy invasions positively (Gelman et al., 2018; 2021), and do not approve of lying as a form of privacy protection (Tan et al., 2025). Together, these findings provide converging evidence on a topic where relatively few experimental studies currently exist. The consistency in age-related changes across these studies, including my own, is particularly important, as it helps strengthen confidence in the emerging pattern that young children under 7-years-old may not yet reason about privacy protection in ways that align with older children's reasoning. .

As alluded to earlier, exploratory analysis did reveal some interesting nuance in young children's reasoning. The analysis comparing children who passed the comprehension question versus those who did not in Experiment 1 suggests that only younger children who understood the prompt benefited from making privacy more salient at the test. In fact, younger children who did not understand the prompt judged it as acceptable to share the pictures of real Sally as opposed to being more uncertain. These findings provide some interesting insight into young children's thinking. Namely, they suggest that young children, when prompted, likely appreciate that privacy protection entails withholding information, but also that they may be less certain than older children about what types of information ought to be withheld. Namely, young children never showed condition differences. Similar to older children, young children only showed a stronger appreciation of this fact when privacy was made more salient to them. Prior work might suggest that young children do not truly understand privacy at all. For example, across prior tasks, young children do not appear to show an appreciation that privacy violations are indeed violations and that privacy ought to be protected. Our findings suggest that young

children have some knowledge about privacy. At the very least, they seem to know that it's managed by withholding information from others. These findings highlight that more work will need to be done using explicit tasks that directly ask about privacy to better understand young children's thinking about privacy.

These same exploratory findings with the comprehension question are also helpful in ruling out some concerns with our task. One might be concerned that younger children's uncertainty in our tasks (i.e.,g chance judgments) represents confusion; however, the differences between the two comprehension question groups suggest that, at the very least, when children are confused, they likely opt to make judgments to share the picture (not answer at chance rates) and so, I believe our interpretation of children's chance judgements as meaningful is warranted. However, to help avoid this potential issue in the future, future work should consider including other kinds of test questions, such as Likert or explanation-type questions, as they likely would not have the same measurement issues.

Throughout this paper, I have discussed privacy reasoning as a sort of normative reasoning. As already alluded to, in the present investigation, children's judgments of what should be shared or withheld likely rely on at least two pieces of normative knowledge: 1) an understanding that privacy governs normative considerations of what one "should" do in information-sharing contexts; 2) an understanding of the kinds of content these privacy norms apply to (i.e., personal images). Because privacy is culturally situated (see Li 2022, for a review in adults), it seems likely that learning about privacy is a type of norm learning. The growth in children's knowledge about privacy norms is indeed compatible with broader developmental literature showing that cross-culturally, children tend to learn and enforce culturally specific norms around sharing and rule-breaking during middle childhood (Pauluus & Schmidt, 2018).

However, this discussion brings into question what is changing about privacy reasoning in childhood beyond knowledge. I have argued that alongside some privacy knowledge, the salience of privacy knowledge or its perceived importance for making decisions is also developing. So, what might affect its salience? One possibility is risk perception. According to privacy calculus theory, individuals are more aware of their need for privacy when they believe there is a risk associated with information disclosure (Culnan & Armstrong, 1999). For example, users will share less personal data in online social networks when they perceive a greater privacy risk associated with audience exposure and data misuse (Krasnova et al., 2010). In other words, this perception of risk leads them to consider their privacy and be more cautious. Because our trust in others declines with age (see work on positivity bias in childhood; Boseovski, 2010), it seems likely our risk perception gets better. It may be this change in risk perception that might be leading to changes in the salience of privacy and thus adherence to privacy norms with age.

Beyond implications for understanding conceptual development, the present findings have practical implications for policy and education. If children's privacy reasoning is partly constrained by immature risk perception, then educational efforts should not focus solely on teaching children procedural strategies for managing privacy settings or memorizing rules about online safety. Rather, interventions should explicitly target teaching children *why* privacy norms exist, namely, the potential interpersonal, reputational, and long-term consequences of disclosing personal information. Taken together, these findings point towards a dual approach. Robust policy safeguards for children who may not reliably recognize when privacy is at stake. At the same time, developmentally tailored educational interventions, including well-timed prompts, structured reflection, and explicit discussion of risk, may leverage children's emerging capacity to reason about when and why they should protect their privacy.

Clinical Implications

These findings highlight the importance of addressing children's digital behaviour within psychological practice. Children are using digital technologies frequently, and the developmental period examined in this research is characterized by rapid cognitive and social growth. Despite this growth, the findings suggest that children across this age range do not yet demonstrate adult-like reasoning about privacy, leaving many of them vulnerable in digital environments. Younger children, in particular, appear to be at heightened risk because they may not fully understand the long-term consequences of sharing personal information or images online.

Given the increasing prevalence of online exploitation cases, clinicians working with children should routinely assess digital behaviour as part of standard clinical practice. Just as clinicians ask about school, friendships, and family relationships, it may be important to ask about children's technology use, including what platforms they use, what types of information they share, and whether they have been asked to send photos or personal information online. These conversations can help clinicians identify potential risks and provide opportunities to support the development of safer online behaviours.

Additionally, clinicians should be aware that children's digital behaviour may intersect with experiences of trauma or vulnerability. For example, children who have experienced trauma or who are seeking social connection may be more susceptible to coercion or manipulation online. As illustrated in the example described in the introduction, where a young child was coerced into sending explicit photographs through a social media platform, online risks can emerge in seemingly ordinary contexts of digital communication. Clinicians may therefore benefit from integrating psychoeducation about digital privacy, consent, and safe image sharing

into therapy, particularly when working with younger children who may not yet recognize these risks.

Conclusion

In sum, I found a developmental shift in children's appreciation of withholding personal images as a privacy protection strategy. Younger children showed more limited spontaneous consideration of privacy. When promoted, their responses revealed an emerging understanding of withholding as a privacy protection strategy. Older children increasingly recognized that real images should be protected. This was especially true when privacy was made salient. These findings highlight middle childhood as a key window for supporting children's privacy reasoning while underscoring the continued need for strong protections for younger children in digital contexts.

References

- Agesilaou, A., & Kyza, E. A. (2022). Whose data are they? Elementary school students' conceptualization of data ownership and privacy of personal digital data. *International Journal of Child-Computer Interaction*, 33, 100462.
- Annable, K., & Allan, M. (2023, December 7). *Seven-year-old Manitoba girl exploited through Snapchat, mother says*. CBC News.
<https://www.cbc.ca/news/canada/manitoba/seven-year-old-exploitation-snapchat-9.7049065>
- Bates, D., Mächler, M., Bolker, B., & Walker, S. (2015). Fitting Linear Mixed-Effects Models Using lme4. *Journal of Statistical Software*, 67(1), 1–48.
<https://doi.org/10.18637/jss.v067.i01>
- Bietz, M. J., Cheung, C., Rubanovich, C. K., Schairer, C., & Bloss, C. S. (2019). Privacy perceptions and norms in youth and adults. *Clinical Practice in Pediatric Psychology*, 7(1), 93.
- Blinder, E. B., Chetty, M., Vitak, J., Torok, Z., Fessehazion, S., Yip, J., ... & Clegg, T. (2024). Evaluating the Use of Hypothetical 'Would You Rather' Scenarios to Discuss Privacy and Security Concepts with Children. *Proceedings of the ACM on Human-Computer Interaction*, 8(CSCW1), 1-32.
- Corson, K., Colwell, M. J., Bell, N. J., & Trejos-Castillo, E. (2014). Wrapped up in covers: preschoolers' secrets and secret hiding places. *Early Child Development and Care*, 184(12), 1769-1786
- CyberTip (2023, December 31). Reports from the public processed in 2023. CyberTip.ca.
<https://cybertip.ca/en/about/reports-from-public-processed-2023/>

- Cleroux, A., Peck, J., & Friedman, O. (2022). Young children infer psychological ownership from stewardship. *Developmental Psychology*, 58(4), 671–679.
<https://doi.org/10.1037/dev0001325>
- Ey, L. A., & Glenn Cupit, C. (2011). Exploring young children’s understanding of risks associated with Internet usage and their concepts of management strategies. *Journal of Early Childhood Research*, 9(1), 53-65.
- Gelman, S. A., Cuneo, N., Kulkarni, S., Snay, S., & Roberts, S. O. (2021). The roles of privacy and trust in children's evaluations and explanations of digital tracking. *Child development*, 92(5), 1769-1784.
- Gelman, S. A., Martinez, M., Davidson, N. S., & Noles, N. S. (2018). Developing digital privacy: Children's moral judgments concerning mobile GPS devices. *Child development*, 89(1), 17-26.
- Gelman, S. A., Nancekivell, S. E., Lee, Y., & Schaub, F. (2025). Childrens understanding of digital tracking and digital privacy. In Christakis, D. A., & Hale, L. (Eds), Handbook of children and screens: Digital media, development, and well-being from birth through adolescence. Springer.
- “Girl in Bedroom/ Livingroom/ Kitchen” image generated by Canva's Text-to-Image, February 15, 2023)
- Hall, D. G., Sowden, A., & Dharmawan, E. (2023). Children's sensitivity to authenticity in their extension of brand names. *Cognitive Development*, 66, 101314.
- Hartley, C., Colbourne, L., Lokat, N., Kelly, R., & Shaw, J. J. (2025). Investigating children's valuation of authentic and inauthentic objects: Visible object properties vs. invisible ownership history. *Cognition*, 254, 105935.

- Hoyle, R., Stark, L., Ismail, Q., Crandall, D., Kapadia, A., & Anthony, D. (2020). Privacy norms and preferences for photos posted online. *ACM Transactions on Computer-Human Interaction (TOCHI)*, 27(4), 1-27.
- Kumar, P., Naik, S. M., Devkar, U. R., Chetty, M., Clegg, T. L., & Vitak, J. (2017). 'No Telling Passcodes Out Because They're Private' Understanding Children's Mental Models of Privacy and Security Online. *Proceedings of the ACM on Human-Computer Interaction*, 1(CSCW), 1-21.
- Moore, D., Morrissey, A. M., & Robertson, N. (2021). 'I feel like I'm getting sad there': early childhood outdoor playspaces as places for children's wellbeing. *Early Child Development and Care*, 191(6), 933-951.
- Neary, K. R., & Friedman, O. (2014). Young children give priority to ownership when judging who should use an object. *Child Development*, 85(1), 326-337.
- Noles, N. S., & Gelman, S. A. (2014). You can't always want what you get: Children's intuitions about ownership and desire. *Cognitive Development*, 31, 59-68.
- Nissenbaum, H. (2011). A contextual approach to privacy online. *Daedalus*, 140(4), 32-48.
- Oates, M., Ahmadullah, Y., Marsh, A., Swoopes, C., Zhang, S., Balebako, R., & Cranor, L. F. (2018). Turtles, locks, and bathrooms: Understanding mental models of privacy through illustration. *Proceedings on Privacy Enhancing Technologies*.
- Paulus, M., & Schmidt, M. F. (2018). The early development of the normative mind. *Journal of Experimental Child Psychology*, 165, 1-6.
- Pesowski, M. L., & Friedman, O. (2019). Children value objects with distinctive histories. *Journal of Experimental Psychology: General*, 148(12), 2120.
- Qu, L., & Ong, J. Y. (2016). Impact of reminders on children's cognitive flexibility, intrinsic

motivation, and mood depends on who provides the reminders. *Frontiers in psychology*, 6, 1904.

Sevinçli, N., & Şahin, B. E. (2024). Rethinking the designs of private spaces in kindergartens through the views of children. *Childhood*, 31(2), 152-175.

Sun, K., Sugatan, C., Afnan, T., Simon, H., Gelman, S. A., Radesky, J., & Schaub, F. (2021).

“They see you’re a girl if you pick a pink robot with a skirt”: A qualitative study of how children conceptualize data processing and digital privacy risks. *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems* (pp. 1–34).

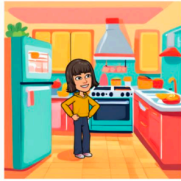
Yip, J. C., Sobel, K., Gao, X., Hishikawa, A. M., Lim, A., Meng, L., ... & Hiniker, A. (2019, May). Laughing is scary, but farting is cute: A conceptual model of children's perspectives of creepy technologies. *In Proceedings of the 2019 CHI conference on human factors in computing systems* (pp. 1-15).

Zhang-Kennedy, L., Mekhail, C., Abdelaziz, Y., & Chiasson, S. (2016, June). From nosy little brothers to stranger-danger: Children and parents' perception of mobile threats. *In Proceedings of the The 15th International Conference on Interaction Design and Children* (pp. 388-399).

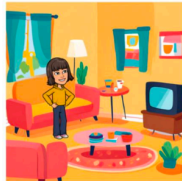
Zhao, J., Wang, G., Dally, C., Slovak, P., Edbrooke-Childs, J., Van Kleek, M., & Shadbolt, N. (2019, May). I make up a silly name' Understanding Children's Perception of Privacy Risks Online. *In Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems* (pp. 1-13).

Figure 1. *Stimuli for Experiment 1*

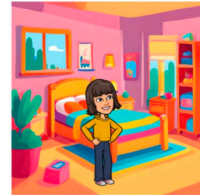
The game wants to take a picture of cartoon Sally in her kitchen



The game wants to take a picture of cartoon Sally in her living room



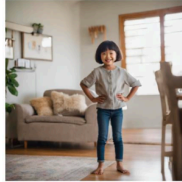
The game wants to take a picture of cartoon Sally in her bedroom



The game wants to take a picture of real Sally in her kitchen



The game wants to take a picture of real Sally in her living room

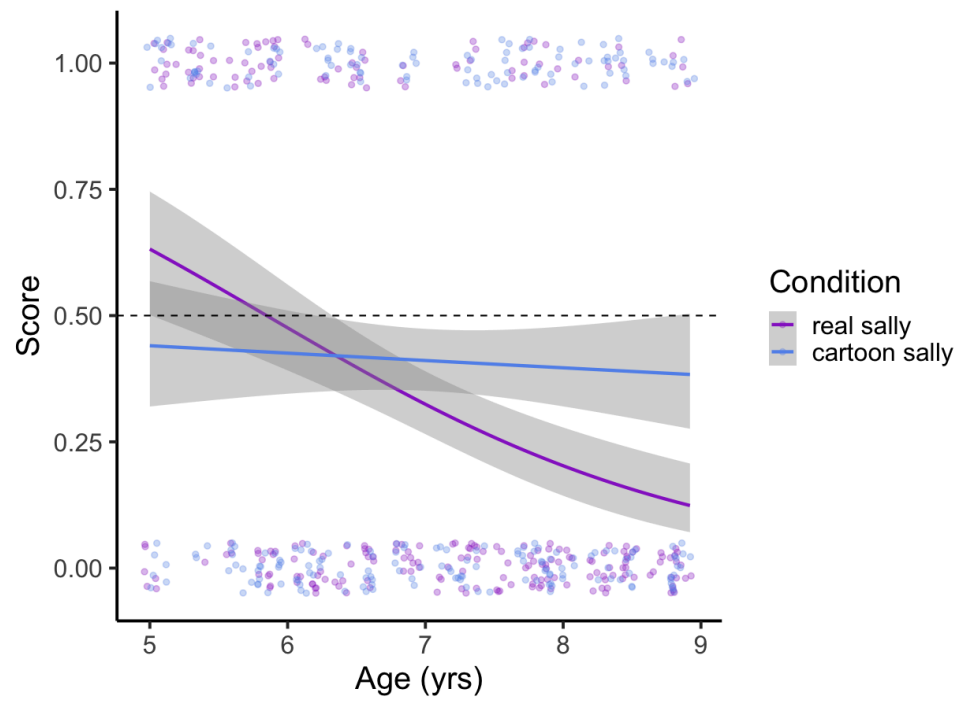


The game wants to take a picture of real Sally in her bedroom

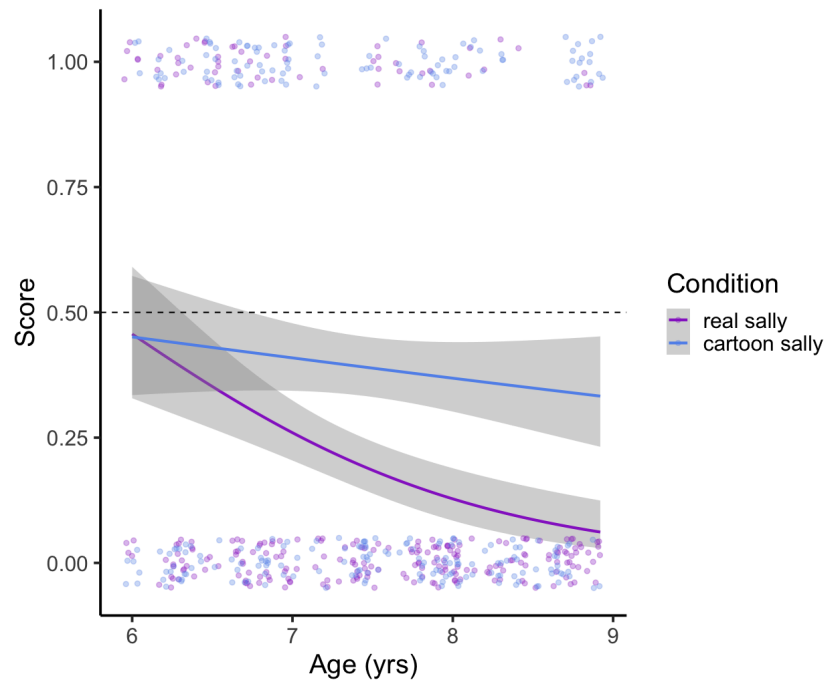


So, the game wants to take a picture of ____ in her _____. Should Sally let the game take the picture, or not take the picture?



Figure 2. *Experiment 1: Developmental Trends in Scores by Condition*

Note. Children were scored as 1 = take picture and 0 = do not take picture. Higher scores indicate greater acceptance of taking a picture. Scatterplot depicts individual data points.

Figure 3. *Experiment 2: Developmental Trends in Scores by Condition*

Note. Children were scored as 1 = take a picture and 0 = do not take picture. Higher scores indicate greater acceptance of taking a picture. Scatterplot depicts individual data points.

Appendix A

Informed Consent Form for Parents/Guardians



Dr. Shaylene Nancekivell
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Parent/Legal Guardian Consent Form

Research Project Title: Living Lab Research Studies

Principal Investigator and Contact Information:

Dr. Shaylene Nancekivell, Assistant Professor
Department of Psychology
shaylene.nancekivell@umanitoba.ca

This consent form, a copy of which will be left with you for your records and reference, is only part of the process of informed consent. It should give you the basic idea of what the research is about and what your participation will involve. If you would like more detail about something mentioned here, or information not included here, you should feel free to ask. Please take the time to read this carefully and to understand any accompanying information.

Description of the purpose of the research: I am asking you to allow your child to participate in this research study because we are interested in what children between the ages of 2 and 12 know about different basic concepts related to people, objects (both virtual and real), and learning, and how these concepts develop over time. These projects will fill a large gap in what is known about children's social cognitive theories and how they evolve across the lifespan.

Procedures involved: This research project will take between 2 and 5 minutes. It will involve your child answering questions after listening to a story that the experimenter tells them. We will record your child's answers by writing them down on piece of paper or by selecting their answers on a tablet. Participation in this research project is voluntary. It can be ended at any time.

Remuneration: Your child will be given a small item worth no more than \$2 as a prize for participating. They will be offered this prize immediately after participation.

Potential benefits: The proposed research aims to increase our understanding of basic social-cognitive concepts including how these concepts develop over the lifespan. This research may directly benefit the scientific community. There are no direct benefits to individual participants in this research study other than the opportunity to meet with a scientist and learn about the scientific process.

Potential risk: Except for the time your child spends on this project there are no known or foreseeable additional risks involved with this study as compared to your child visiting any other exhibit at the museum.

Withdrawal: You can withdraw from this study at any time during the study or by visiting the Living Lab anytime that same day. Because we do not collect identifying information, we cannot delete your data after we close the Living Lab for the day. If you withdraw we will delete your data within one business day.

Data confidentiality: Data will be collected in an indirectly identifiable state. Only general descriptors will be used. For example, we might refer to individual children as "one 4-year-old girl" or to an entire



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age group "50% of 4-year-olds". We will be writing down your child's responses to our surveys and asking for demographic information which includes your child's age in years, and month of birth, initials, racial identity, and gender identity. If you do not wish to provide any of this demographic information, your child may still participate. To protect your child as much as possible, only researchers involved in the project will have access to your child's initials. Data with initials will be stored on password protected servers. If you are completing this consent on paper, paper forms with initials will be stored in a locked filing cabinet in a Department of Psychology Research Space.

Research Results and Data Sharing: Some data and information from this study may be sent outside of the University of Manitoba to other researchers, organizations, or made publicly available. This is for further analysis, testing, or as part of the research study. Any data files we share outside the University will not contain your children's initials.

Debriefing: After the study, the researchers are available to talk about the study and current findings any time the Living Lab station is open. You may also visit www.youngmindsresearch.com/livinglabstudies to view our findings or email the PI at shaylene.nancekivell@umanitoba.ca. Preliminary findings are released within 6 months of participating.

By checking the box on this form, you indicate that you have understood to your satisfaction the information regarding participation in the research project and agree to your child participating as a subject. In no way does this waive your legal rights nor release the researchers, sponsors, or involved institutions from their legal and professional responsibilities. You are free to withdraw from the study at any time during the study, and /or refrain from answering any questions you prefer to omit, without prejudice or consequence. Yours and your child's continued participation should be as informed as your initial consent, so you should feel free to ask for clarification or new information throughout your participation.

The University of Manitoba may look at your research records to see that the research is being done in a safe and proper way.

This research has been approved by the Research Ethics Board at the University of Manitoba, Fort Garry campus. If you have any concerns or complaints about this project you may contact any of the above-named persons or the Human Ethics Officer at 204-474-7122 or HumanEthics@umanitoba.ca. A copy of this consent form has been given to you to keep for your records and reference.

☐ I am the legal guardian of this child. I understand to my satisfaction the information regarding participation in the research project and agree to for my child to participate as a subject.

Appendix B**Child Assent (Verbal Script)**

Would you like to play our research games and listen to our story? *[wait for child's response]*

If yes, Okay great! Just let me know if you want to stop for any reason and we will just stop.